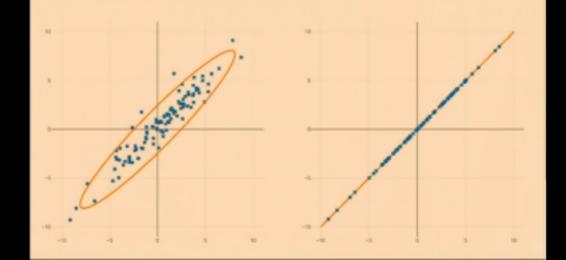
- 1) Risk of extinators
- 2 Distribution of Back

Principal Component Regression

PCR: Je=argmin 11 Y - XPRYe 112= (PL XTXPR) PLXTY



Y=XB+E, ENN(O,In) BCOLS) = arguin 117-XTB/2 =(X+X)-1XTY BIPCR PE(PETXTXPE) PREXTY 1) Risk of extinctors S DiRupmien of Back, sias varianu

```
(1) Bestinator for p, Elp]= m, Coo(p)= E
E[ 11 ps-15112] = E[11 ps-1+1-15112]
  = E[(B-n+r-p) (B-n+r-p))
  - E[11 B- M/2]+2E[(B-M) (M-B)]
       variance = E[\hat{\beta} - E[\hat{\beta}] \( \beta - \beta \)
      + | | | | | | | = (E[)[]-E[)[) (m-1)
     1 2 lhois 1/2, bias- M-13
E[1|p- m/2]= E[(p-m) (p-m)]= E[tr((p-m) (p-m)]
  = E[tr((p-m)(p-m))]-tr(E[(p-m)(p-m)]=tr(E)
```

n my p n X full roule BCOLS) = arguin 114-XTB/2 =(X+X)-1XTY BIPLE PLE (PETXTXPE) PLEXTY 1) Risk of extinctors 2 Distribution of BCOCK) Buch NOPERT & RE DE PIE barrance PCR

2) fr=114-XPmyll2, BCPCR)=Prof BCPCR) = Pla (Pla XTXPa) Pat XT(XB+E) = Ph(PhPDPTPh)-1Pt (XX13+XTE) = [Vi] V, ... Vk] = [0:0] PERPOPTRE = Co. 2k P-R] = FIDE PIT (XTXB+XTE) E[isece)]=P&Di'PkTPDPTB=Pk[ise, G]PTB=PkPkB =[21.00] Cou(per)) = PeDe-PEXXXPEDE PE = PEPE PEPDP PIDE PE = PROKPE

$$\begin{array}{ll}
\left(\frac{\partial}{\partial t}\right) & \left(\frac{\partial}{\partial t}\right) \sim \mathcal{N}(\rho, (X^TX)^{-1}) \\
&= \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) \\
&= \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) \\
&= \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) = \left(\frac{\partial}{\partial t}\right) \\
&= \left(\frac{\partial}{\partial t}\right) = \left($$

(3) ctd. BCP) = argmin 114-XBII2++ TIBII2 =(XTX+CIP)-XTY E[p(R)] = (XTX+TIp)-1XTXB=(PDPT+TIp)PDPTB = (P(D+ZIp)PT)PDPT(S=P(D+ZIp)-PTPDPT) = PDPB, Dii = Zi = 1+ \frac{7}{2i+7} = 1+ \frac{1}{3i} Shrinkege Var(B(K)) = +[(XTX+TIP) XTX(XTX+TIP)] $\int_{\mathbb{R}^{d}} \int_{\mathbb{R}^{d}} \int_{$ = \(\frac{71}{51.+1}^2